Novelty Journals

ISSN 2394-966X

International Journal of Novel Research in Life Sciences
Vol. 9, Issue 2, pp: (104-106), Month: March - April 2022, Available at: www.noveltyjournals.com

IN VITRO PROTOCOL OPTIMIZATION FOR MASS PROPAGATION OF ELITE DATE PALM VARIETIES IN ETHIOPIA: SHORT COMMUNICATIONS

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Abstract: **Date palm (Phoenix dactylifera L.) is a dioeciously farmed, highly outbred plant with great genetic variation. It's also the most nutritious food, and it can withstand more drought, heat, and salinity in the soil than other crops. The most significant impediment to commercializing this crop in Ethiopia was its tissue culture technology, particularly in the Afar region. This region is based on a nomadic lifestyle, and this crop is more important than any other, especially because its fruits are easy to transport. Multiplying dates in the laboratory, on the other hand, presents a number of difficulties. Skill, plant woodiness, high phenol release, and a lack of initial suckers are a few of them. The purpose of this communication is to raise knowledge of a few strategies as well as their drawbacks.**

Keywords: **Date palm, Disinfections, Explants, Hormones.**

1. INTRODUCTION

In North Africa and the Middle East, the date palm (Phoenix dactylifera L.) is a salt- and drought-tolerant fruit crop (Mahmoud and Prakash, 2015). Its fruits are high in nutritional and medicinal value, containing roughly 70% sugar and a variety of minerals and vitamins (Maqsood *et al*., 2020). Its usage as a livestock feed supplement adds a lot of value to the tree. Syrups, jams, ice creams, baby meals, alcoholic beverages, and soft drinks are examples of value-added products made from fruits, which are in high demand in the market. The date palm also contributes significantly to the establishment of equable microclimates within desert ecosystems, allowing other agricultural crops to be produced as intercrops in otherwise severe desert environments. Date palm trees are important components of farming systems in dry and semi-arid climates, and they can be grown on small farms or in large-scale commercial plantations (Nasser *et al.*, 2012).

The authors also said that the date palm has been employed as an important fruit in Jewish, Christian, and Islamic rites. Dates are also a traditional food for Makka pilgrims and a popular breakfast food during Ramadan fasting. The date palm was called the "tree of life" in the Bible because of its great nutritional content, productivity, and long life (around 100 years). The Afar region of Ethiopia is ideal for date palm farming. It is situated in the Danakil Depression, which has Ethiopia's worst environment, with temperatures reaching 50 degrees Celsius. The Afar people, who are mostly semi-nomadic, live in the area. Date palm farms were created by the Afar in the Awash Delta and Afambo region in the past.

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Date fruits are grown primarily for local consumption on these farms. There is now a date fruit shortage in Ethiopia, where demand peaks during the month of Ramadan. Furthermore, compared to other date-producing countries such as the United Arab Emirates, labor expenses are much lower (UAE). Dates are so enticing for low-cost local production to meet considerable demand in particular parts of Ethiopia and potentially beyond (Aregawi Lemlem *et al.*, 2018).

Date palms are typically propagated through suckers. The lack of suitable planting materials, the problem of inducing roots in suckers, and the problem of true to type are the major challenges in propagating an elite genotype of date palm using traditional propagation methods.

As a result, in order to fully meet the planting demand, a new technology to multiply dates is required.

Micropropagation is now the only viable technology for producing disease-free seed of newly developed date palm varieties on a wide scale in order to accelerate the breeding and commercialization process.

The creation of a suitable nutritional medium, comprising its chemical composition and physical shape, plant growth regulators, and culture environment, is critical for successful date palm in vitro cultivation. In plant tissue culture, the most significant regulating factor of growth and morphogenesis is media composition. Macro and micronutrients, vitamins, amino acids, sugar, other unspecified organic supplements, hardening agents, and growth regulators are all common ingredients in plant tissue culture media. The basal medium containing the MS mineral salt mixture is the most extensively used media for date palm tissue culture. Growth regulators are the most important chemicals in manipulating explant growth and development *in vitro* (phytohormones). The pattern of development in culture is usually determined by the concentration and ratio of these chemicals in the media. IAA, NAA, 2,4D, and IBA are the most regularly employed auxins in date palm shoot tip and inflorescence cultures. The most often utilized cytokinins and substances with cytokinin effects in tissue culture appear to be zeatin, kinetin, BA, 2ip, and TDZ, despite the fact that there are other cytokinins and substances with cytokinin effects (thidiazuron).

The degree of responsiveness to in vitro culture differed significantly between genotypes. As a result, more research across a wide range of genotypes is needed to identify the best in vitro strategies for date palm clonal propagation and in vitro conservation.

As a result, the experiment's main goals are: Optimize *in vitro* procedures for rapid multiplication of elite date palm types, as well as mass propagate and conserve disease-free date palm planting materials.

2. METHODOLOGY

PLANTING MATERIALS:

Melkawere Research Center and the Afambo date palm site yielded three date palm cultivars (suckers): Barhee, Medjool, and Kalass.

EXPLANT EXCISION AND DISINFECTION:

Young suckers with a height of 50–70 cm were gathered and used as explant sources. Extraneous tissue, roots, and leaves were cut and removed until the plant reaches a height of 4 or 5 cm. These items were brushed after being thoroughly washed (2–3 times) under tap water with a local liquid detergent solution.

Then, under non-aseptic settings, the clean, clipped explant sources were cleaned with a different concentration of local bleach for a varied period (2.5%, 3% and 3.5%). The explants were subsequently being transported to the laminar flow hood cabinet and disinfected a second time in various concentrations of local bleach or Berekina for varying periods of time.

CULTURE INCUBATION

After removing all the dead and chlorine-affected tissues, 1 cm shoot tip meristems were taken to be used as explants. These explants were subsequently be injected with a PGR-free and various types and concentrations of growth regulators in MS medium (Murashige and Skoog, 1962).

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SHOOT MULTIPLICATION

Established cultures were transferred to the next multiplication medium after months of culture. BA and kinetin were added to the medium in various combinations and concentrations. At 30-day intervals, cultures were sub-cultured on fresh media with the same mix.

SHOOT ELONGATION AND ROOTING

Single plantlets were moved to different strengths of 1/2 MS or MS basal medium, supplemented with GA_3 and hormone-free.

ROOTING

Single plantlets were transplanted to various strengths of 1/2 MS or MS basal media supplemented with NAA, IAA, and hormone-free.

SUMMARY OF PROGRESS

For a variety of reasons, we have not yet implemented our plan. We attempted to improve disinfection and explant identification. We were unable to obtain plantlets that had been established.

CHALLENGE

Several difficulties were found during laboratory work. Lack of initial suckers, skills in handling date palm explants in the tissue culture laboratory techniques of *in vitro* multiplication of date palms, difficulty in separating young suckers from the mother tree, and damage to explant source plants due to hammering, contamination, and phenol were just a few of them.

THE WAY FORWARD

It requires knowledge transfer from countries with a large number of date palm tissue culture enterprises.

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